Competition, Learning and Persistence in the Effects of Unmeritocratic Hiring Decisions

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ABSTRACT

Sometimes wide disparities in workers’ earnings are defended as simply the meritocratic outcome of a competitive process. While inequalities due to discrimination or luck are admitted as temporary possibilities, it is frequently argued that competition and the profit motive will eliminate them in the longer term. In the present paper, this position is challenged. A model is developed to demonstrate that hiring errors can have persistent effects on individual workers’ earnings under conditions of capitalist competition. Hiring errors give the beneficiaries opportunities to learn and improve in their new jobs, raising the possibility that their initial advantages can become locked in. The model shows how fundamental features of the capitalist system (competition, the profit motive, the free labour exchange) can reinforce, and not always eliminate, these early advantages. While the emphasis is on random error, the same factors will play a comparable role in perpetuating the effects of discriminatory hiring decisions.

Keywords: Job competition, learning, inequality, luck, chance, discrimination
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1. Introduction

Inequalities that arise within capitalist societies as a result of differences in workers’ employment outcomes are sometimes defended on the grounds that they merely reflect ‘merit’ and individual free choice. This argument has been advanced in the past by some philosophers (e.g. Bauer, 1981; Letwin, 1983) and has even appeared in the occasional economics textbook (e.g. Phelps, 1967), but perhaps is most frequently heard at the popular level. The notion that there is a meritocratic foundation to workers’ earnings may also partially motivate existing opposition to affirmative-action schemes and various policies designed to redistribute income. The implicit inference appears to be that earned income must broadly reflect merit, because competitive pressures would surely eliminate discrimination and punish prejudiced decision-making. From this perspective, any policy that modified the distribution determined within the marketplace would appear to weaken the meritocratic outcome generated by the system.

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1 The term ‘merit’ undoubtedly has diverse meanings for different people. The precise meaning attributed to the term for the purposes of the present analysis shall be articulated later, in presenting the formal model. In broad terms, though, the term shall be taken to refer to a worker’s productive capability, including his or her potential for improvement in this capability through learning.

2 Phelps instructs his student readers that “In relating wages to workers’ productivity as measured by market demand, it satisfies ethical as well as logical requirements. Men are paid what they are worth, rather than according to their social positions (just price), job characteristics (Smith), subsistence requirements (Ricardo), the available working capital (wages fund), what is left over (residual claimant), need (Marx), or bargaining power (Webbs)” (Phelps, 1967, p. 497, emphasis in original). In this passage, Phelps is actually referring to the marginal-productivity theory of wages, which he regards as the theory of wage determination most closely fitting reality. This quote, taken from a past labour economics textbook, is admittedly hand-picked and perhaps unrepresentative, but it makes explicit a perception that is probably shared by some sections of the wider community.
Quite apart from deeper issues concerning the virtues of meritocracy is the more immediate question of whether capitalist social relations actually do ensure, or at least encourage, meritocratic outcomes. Much work has been done to document the apparent pervasiveness of employment discrimination (a recent review is provided by Mason, 1999), some economists arguing that discrimination is not only consistent with, but instrumental to, profit maximisation and the motive drive of capital (e.g. Darity, 1989; Darity and Williams, 1985; Mason, 1993, 1995; Shulman, 1984; Williams, 1987, 1991). Yet, even if capitalism could be relied upon to eliminate all discrimination, this would be insufficient to ensure that wages always truly reflected a worker’s merit and free choices, simply because there will always be an element of chance in any individual’s employment outcomes.

When it comes to a person’s employment success, luck can of course exert an influence at many levels, and at many points in life, not least in the lottery of birth. In the present paper, attention is confined to the consequences of luck at the point of hiring. Informational asymmetries make it inevitable that employers will occasionally err when choosing among job applicants. If it were possible for unprejudiced, profit-maximising employers to have their time over, they would make different recruitment decisions in these instances. Once a selection has been made, however, and a degree of worker learning has occurred on the job, an employer’s decision over whether to reverse any hiring error becomes more involved. This will be so even if hiring and firing are assumed to be costless and instantaneous in execution.

For a ‘merit-based’ defence of inequality to be convincing, it would need to be demonstrated that such random events have no significant, long-lasting effects on individual workers’ earnings; or, at least, that under capitalism, there is a tendency for underlying systemic forces to exert pressure in this direction. The question becomes: can the effects of good and bad luck reasonably be expected to ‘cancel out’ for an individual over his or her lifetime?

Coram (1998) notes a general neglect of the longer term influences of luck by researchers in the social sciences and attributes the oversight to a widespread belief, stemming perhaps from a misinterpretation of the ‘law of large numbers’, that the effects of chance events do indeed tend to ‘cancel out’ over time. In the present paper it is contended that, to the contrary, in the case of hiring errors, key features of the social system can be expected to work precisely against such a ‘cancelling out’ of the effects of luck.

The argument is developed with the aid of a simple model. Within the model, workers who are incorrectly hired ahead of more capable applicants gain an opportunity to learn and improve on the job. With a sufficient headstart they may overtake superior applicants in terms of cost efficiency measured at a given moment. While superior workers have the potential, if hired, ultimately to achieve greater cost

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3 It is important here to distinguish between tendencies operating at the group rather than individual level. In a hypothetical world without prejudice and discrimination, capitalist social processes might well be expected to result in strong correlations between the earned incomes and merits of broad categories of workers, taken on the average and controlling for the element of individual choice. Or, more realistically, within a segmented workforce in which members of each segment have differential access to employment opportunities, such a drive towards meritocracy on the average might be expected to operate within each segment. But for an individual worker whose employment success failed to reflect merit and personal preference, the existence of a tendency working at a more aggregate level would be of little solace. In a sense, in what follows, it shall be argued that some of the key features of the capitalist system (e.g. competition, the profit motive) that might be expected to generate a tendency towards meritocracy on the average, at least within workforce segments, can be the very factors that prevent meritocratic outcomes from being realised in individual instances.

4 This charge is possibly less applicable to economists than other social scientists, given, for instance, the interest of a significant number of economists in the consequences of the irreversibility of many socio-economic and historical processes (e.g. the substantial literature on path dependence).
efficiency than incumbents, there would be an interim period during which their performance would actually be inferior. In such a scenario, the so-called ‘free labour exchange’, by allowing either the worker or employer to end the arrangement at any moment, creates uncertainty for the employer over how long a replacement is likely to remain with the firm once hired. In cases where correcting a past error would require the employer to endure an initial period of higher costs, employers cannot be sure that replacements will stay long enough for their potential to bear fruit in the form of lower costs. Accordingly, the profit motive will sometimes dictate that employers stick with incumbents, even if unmeritocratic decisions have clearly been made.

In this way, hiring errors, even if recognised, will not always be corrected, primarily because of two inherent features of the capitalist system: the free labour exchange and the profit motive. The former makes any potential gains of a replacement worker necessarily uncertain and contingent; the latter compels the employer to make decisions solely on the basis of expected costs, rather than any other criterion, such as ‘merit’ or ‘fairness’. In some instances, the decision that is expected to maximise profit may coincide with the meritocratic outcome. But this will not always be the case. The main purpose of the present paper is to clarify some of the factors that will influence the outcome in any individual case, and in doing so, to demonstrate the unlikelihood of capitalist competition promoting the reversal of past hiring errors in many instances.

2. Job Competition

The very notion of a merit-based distribution of earned income presupposes that requisite mechanisms or institutions are in place to ensure that individuals are given the opportunity to exercise, and be rewarded for, relevant personal qualities such as innate abilities, skills, intelligence, knowledge, experience, self-discipline, initiative, obedience or effort. Casual reflection suggests that, in the main, jobs are not tailored to the personal qualities of workers, but rather, from the perspective of the worker, are already in existence, shaped by a variety of social and technical factors that operate beyond the merely individual realm. If the distribution of earned income is to reflect merit, it must be through some channel other than the way in which jobs are designed. Specifically, workers, in competing for more or less predefined jobs, would need to be ranked in such a way that the most meritorious among them were assured of winning the ‘best’ positions. It is through this indirect means that workers’ personal qualities might be expected to exert an influence on rankings within the income scale.

This distinction is emphasised by Thurow (1972, 1975) in his theory of job competition. In Thurow’s theory, the determination of the distribution of wage income can be viewed in two basic steps. One set of factors shapes the types of jobs that are created, the proportions in which these various forms of employment are offered and the nature of the varying job hierarchies that are developed within firms. Another set of factors, logically separable from the first, though not entirely independent of the distribution of job opportunities, influences workers’ rankings within the consequent job queues and hence their relative success in the competition for available positions.

More specifically, within Thurow’s theoretical setting, workers are depicted as competing for employment opportunities that have been shaped by three main factors: society’s technical knowledge, the nature of training costs across jobs, and sociological determinants of wages. Given the wide variety of explanations that could be advanced in relation to these three factors, it is evident that Thurow’s framework is sufficiently open to accommodate more than one theory of job formation. Of particular note, room is left for competing theories of wage determination. In Thurow’s framework, “wages are paid based on the characteristics of the job” (Thurow and Lucas, 1972, p. 2), not the worker. Although this perspective allows for the possibility that wages may reflect marginal productivity or some other measure of productive contribution (with the characteristics of the job determining the worker’s productiveness), alternative theories emphasising sociological, cultural or historical determinants of the distribution of
wage income can just as easily be situated within the theoretical framework, and indeed a sociological determination unrelated to productive contribution shall be assumed in the present analysis.\\(^5\) Similarly, the job-competition framework is open to the possibility that capitalist employers design jobs with issues of hierarchy and control in mind. For example, jobs that are of greater strategic importance to capitalist employers – typically technical, scientific or managerial positions – will tend to entail higher remuneration and better working conditions (Mason, 1993, pp. 14-16). Such considerations of hierarchy and control are also likely to influence the development of society’s technical knowledge, another of Thurow’s factors affecting the distribution of job opportunities, since it is capitalists who ultimately decide which technologies are adopted out of the various possibilities developed by inventive individuals and organisations. Inventors, in turn, cannot afford to be oblivious to the likely preferences of capitalists.

For the purposes of the present analysis, the most important aspect of the job-competition framework is the observation that, as a result of an ongoing social process, workers are confronted at any point in time with an existing distribution of job opportunities; opportunities that, in a sense, appear predefined, arising independently of workers’ own personal qualities and interests. Most workers must compete for such predefined positions and, if successful, submit to whatever training is required to fulfil the role. Employers, in making hiring decisions, must rely on workers’ imperfectly observable background characteristics to select those who are capable of attaining the desired level of productivity – or, less stringently, a level of productivity regarded by the employer as acceptable – with the least investment in training.

Since workers are trained to the level required by the position, and productivity is primarily determined by the job, not the worker, the development of workers’ productive capabilities is closely tied to their current jobs and personal employment histories. An implication that immediately follows is that hiring errors will alter the training opportunities and learning paths that are open to both the beneficiaries and the victims. The beneficiaries of hiring errors, by obtaining better jobs than the victims, will enter more favourable job ladders with greater opportunities for learning and stronger prospects for advancement. Intuitively, it seems conceivable that the effects on individual earnings will sometimes prove decisive.\\(^6\) Such effects could be negated, however, if the competitive necessities of capitalism dictated the prompt reversal of any such errors, at least in those instances where they were discovered. It is this possibility that requires closer scrutiny.

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5 Thurow himself does posit a connection of sorts between marginal productivity and wages, although the usual direction of causation is reversed. In his approach, marginal productivities are inherent in jobs while wages are sociologically determined. Firms then hire workers up to the point at which “marginal productivity is driven down to the level given by the exogenous wage” (Thurow, 1975, p. 109). But while this is one conceivable approach, others are permissible within the job-competition model. For instance, Mason (1999) integrates Marx’s theory of wages into the framework, in which wages are governed by the culturally determined cost of reproducing labour power and bear no direct relationship to productive contribution. Many other approaches apart from Marx’s depict wages as unrelated to productive contribution, including the theories of Smith and Ricardo, as well as more recent work developed in Marxist, Sraffian, Post Keynesian and institutionalist traditions.

6 Thurow appears to allude to this possibility when he writes: “Individuals could be ranked in terms of their potential economic ability by looking at the job for which they exhibit the highest benefit cost ratio. The costs would be the training costs for that job and the benefits would be the discounted lifetime earnings for the same job. The individual might not, however, be able to realize his potential if he is unable to win the competition for his best jobs. His actual economic ability will be given by the benefit cost ratio of the best job that he is actually able to get” (Thurow, 1975, p.243, note 6).
3. A Simple Model

To examine the issue more closely, a highly stylised scenario shall be considered in which workers compete for a specific job. Associated with the job is a given wage that is assumed to be sociologically determined in a manner not directly related to any measure of productive contribution, and a set of working conditions that have been shaped by the ongoing social processes that affect, in greater or lesser degree, the development of all currently existing employment opportunities. In a broad sense, the stylised scenario can be regarded as taking place within the job-competition setting, although one significant departure shall be made from Thurow’s specific version of the theory that will soon become evident.

It may be helpful to summarise the basic scenario in broad terms before turning to formal modelling. The hypothetical situation can be described as follows:

1. Employers know that there are two types of workers competing for the job. Type 1 workers are less capable than type 2 workers, making them more costly to train to an acceptable level of performance.

2. Worker performance on the job is measured by unit labour cost. A type 2 worker is ultimately capable of achieving a lower unit labour cost than a type 1 worker.\(^7\)

3. Employers cannot observe and accurately interpret all relevant worker characteristics at the point of hiring, making error possible.

4. Once a hiring decision has been made, the employer can try to evaluate whether a worker is performing to expectation. However, the worker’s actual performance is not perfectly observable and must be discerned over time. Any gap between the perceived and actual performance of a worker will only be eliminated once the employer has verified whether the worker is type 2, as initially believed, or type 1, which would indicate that a hiring error has been made. The time it takes to recognise any error – the recognition lag – will vary depending on the precise nature of the job.

5. If it is recognised that an error has been made, the employer must decide whether to replace the incumbent. There are no restrictions on firing and the decision is based purely on cost.

6. In making any replacement, the employer once again possesses incomplete information at the point of hiring, making further error possible.

3.1. Worker Cost Efficiency and Learning

The productive capabilities and learning capacities of the two types of workers shall be represented by simple learning curves, which relate workers’ unit labour costs to amounts of experience on the job. Given the wage and conditions of the job, workers’ unit labour costs will tend to fall, in varying degrees, as they learn with experience. Defining \(u_i(t)\) as the unit labour cost of a type \(i\) worker, \(i = 1, 2\), who has accumulated job-competition theory remains in that, within the model, the degree of a worker’s superiority over another depends largely on the characteristics of the job, and not primarily on differences in workers’ personal traits.

\(^7\) This is the main departure from Thurow’s formulation. In his theory, workers compete on the basis of training costs. Superior workers incur lower training costs for the employer in attaining a target level of productivity. In contrast, in the present model, workers are assessed in terms of unit labour costs. Since it is assumed that superior workers can achieve lower unit labour costs than inferior workers, it follows that they can reach higher levels of productivity. In the present context, there is no contradiction in workers of varying capabilities competing for the same job (with the same wage) and ultimately attaining different levels of productivity, because of the assumption that wages are sociologically determined and unrelated to productive contribution. Despite this departure from Thurow’s formulation, an affinity with the
an amount \( t \) of experience, the learning curve can be given the following specific functional form:

\[
u_i(t) = m_i + c_i e^{-\lambda t}
\]

\( u_i(t) \) can be regarded as a worker’s instantaneous cost efficiency, as it measures the worker’s unit labour cost at a particular moment.

The first component of the learning curve, \( m_i \), is the unit labour cost that the worker tends towards as experience is accumulated. The second component, \( c_i e^{\lambda t} \), is the reducible portion of unit labour cost, intended to characterise the learning process. It equals \( c_i \) when \( t = 0 \) and approaches zero as \( t \to \infty \). The specification of exponential learning ensures that as workers improve with experience, their unit labour costs fall but at a decreasing rate, where \( \lambda_i \) provides an approximate measure of learning speed. The term \( c_i \) denotes the worker’s scope for learning. It indicates the extent to which the worker’s initial unit labour cost, \( m_i + c_i \), exceeds its potential level, \( m_i \).

To reflect the superiority of type 2 workers, it shall be assumed that they approach a lower unit labour cost over time (\( m_2 < m_1 \)). The diagrams in Figure 1 provide three broad cases that can arise under this restriction. In case 1, type 2 workers have less scope for learning (\( c_2 < c_1 \)) and a slower rate of learning (\( \lambda_2 < \lambda_1 \)), whereas in cases 2 and 3 they have greater scope for learning (\( c_2 > c_1 \)) and a more rapid rate of learning (\( \lambda_2 > \lambda_1 \)). In case 3, type 2 workers have a higher initial unit labour cost than type 1 workers (\( m_2 + c_2 > m_1 + c_1 \)), causing the learning curves to cross. Since in the scenario under investigation type 2 workers are assumed to be superior to type 1 workers, it is unclear whether case 3 should be included. Unless the average duration of a worker’s employment in the job is quite long, a type 1 worker would actually cost less along the early portion of the learning curve than a type 2 worker. For this reason, one further restriction shall be placed on the parameters; namely, \( m_2 + c_2 < m_1 + c_1 \), ruling out the case where learning curves cross.\(^9\) Taken together, the restrictions \( m_2 < m_1 \) and \( m_2 + c_2 < m_1 + c_1 \) mean that a type 2 worker’s learning curve lies entirely below a type 1 worker’s learning curve. In other words, the unit labour cost of a type 2 worker is always smaller than that of a type 1 worker whenever experience levels are the same. It is in this specific sense that type 2 workers are taken to possess greater ‘merit’ than type 1 workers throughout the present analysis.

3.2. Hiring Errors

Errors occur when type 1 workers are incorrectly offered jobs ahead of type 2 workers. Once hired, the advantaged workers will have an opportunity to learn on the job and lower their unit labour costs with experience. Given sufficient headstarts, they may succeed in lowering their unit labour costs below the levels that type 2 workers would initially achieve if hired. In each of the diagrams in figure 1, a type 1 worker with an amount of experience \( \tau \) has a lower unit labour cost than a type 2 worker with no experience. If, at time \( \tau \), the employer realises that a mistake has been made, the question of whether it would be profitable to replace the incumbent becomes relevant. With replacement there is the possibility that a further error will occur, which would be costly because the incumbent is more efficient than another type 1 worker with less experience, who has not had the same

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\(^8\) The characterisation of learning in the present model is similar to one used by Spence (1981) in a different context. A specific functional form for the learning curve has been adopted for expositional reasons. Some of the tendencies to be discussed, especially those relating to worker learning, can be brought out more clearly once a specific functional form for the learning curve is chosen. The complete model, cast in more general terms, is presented in the appendix.

\(^9\) This is not to deny that there are some conceivable situations where a superior worker could have a higher initial unit labour cost. However, the purpose of the present analysis is to show that hiring errors will not always be corrected. If this can be demonstrated in cases where the learning curves do not cross, it could certainly be established in cases where they do. For this reason, little is lost by excluding this variation of the basic scenario from the analysis.
opportunity to learn. On the other hand, the successful recruitment of a type 2 worker might prove cost minimising, but will depend on the precise characteristics of the workers’ learning curves, which, in turn, are largely determined by the nature of the job.

3.3. The Replacement Decision

In deciding whether to make the replacement, the key problem for the employer is not to find the precise moment at which a new worker would be expected to achieve a lower instantaneous unit labour cost, but rather the point at which a switch could enable lower expected costs for the entire period under consideration. The length of this period can be defined as the employer’s time horizon, \( h \). Since there is uncertainty over how long workers will stay with a firm once hired (as a result of the free labour exchange), employers’ time horizons will inevitably be finite. The more rapid the rate of turnover associated with the job in question, the shorter the employer’s time horizon is likely to be. The total cost of continuing to employ the incumbent for this entire period is represented in each of the diagrams in figure 1 by the area beneath \( u_i \) between \( \tau \) and \( \tau + h \). The corresponding costs for accidentally employing a new type 1 worker or successfully employing a new type 2 worker are represented by the areas beneath \( u_1 \) and \( u_2 \), respectively, between 0 and \( h \). In general, employers may discount the value of future cost reductions when making recruitment decisions, somewhat modifying the costs implied by these areas.

The switch will only be made if the total, discounted cost of continuing to employ the incumbent for the duration of the employer’s time horizon exceeds the expected, discounted cost of hiring a new worker. For the incumbent, this cost shall be denoted \( C_1^I \). Similarly, the corresponding measures for new type 1 and 2 workers shall be denoted \( C_1^N \) and \( C_2^N \). Letting \( p \) represent the probability of further hiring error, the expected cost of a new worker is then

\[
pC_1^N + (1 - p)C_2^N \]

Assuming risk neutrality for simplicity, replacement will only occur if:

\[
C_1^I > pC_1^N + (1 - p)C_2^N
\]

Since type 2 workers have lower long-run cost efficiencies than type 1 workers, it is inevitable that the right-hand side of (2) would eventually fall below the left-hand side if enough time were allowed to elapse (i.e. if the employer’s time horizon were sufficiently long). If sufficient time did in fact elapse, the situation could never be reversed. This suggests that we can find the point in time (the minimum time horizon) for which the expected cost of hiring a new worker for the upcoming period just falls to the level associated with the incumbent:

\[
Z = C_1^I - \left( pC_1^N + (1 - p)C_2^N \right) = 0
\]

Here, \( Z \) is the expected gap between the total period costs of the incumbent and a new worker. If \( Z > 0 \), replacement is profitable, otherwise it is not. Setting \( Z = 0 \) indicates the minimum time horizon for which the switch could occur, given the shapes and positions of the two types of learning curves.

The total, discounted cost of retaining a type 1 incumbent for the duration of the employer’s time horizon is:

\[
C_1^I = \int_{\tau}^{\tau+h} \left( m_1 + c_i e^{-\lambda t} \right) e^{-rt} \, dt = \frac{m_1}{r} e^{-r\tau} \left( 1 - e^{-rh} \right) + \frac{c_i}{\lambda_1 + r} e^{-\left(\lambda_1 + r\right)\tau} \left( 1 - e^{-\left(\lambda_1 + r\right)h} \right)
\]

This is because the unit labour cost that a new worker would be expected to approach is a weighted average of \( m_1 \) and \( m_2 \), where \( m_2 < m_1 \), and so is smaller than the unit labour cost approached by the incumbent; i.e. \( pm_1 + (1 - p) m_2 < m_1 \) since, by assumption, \( m_2 < m_1 \).
The corresponding costs for replacing the incumbent with a type 1 or 2 worker are:

\[
C_1^N = \int_0^h \left( m_i + c_i e^{-\lambda t} \right) e^{-rt} dt = \frac{m_i}{r} \left( 1 - e^{-hr} \right) + \frac{c_i}{\lambda_1 + r} \left( 1 - e^{-(\lambda_1 + r)h} \right)
\]

\[
C_2^N = \int_0^h \left( m_2 + c_2 e^{-\lambda t} \right) e^{-rt} dt = \frac{m_2}{r} \left( 1 - e^{-hr} \right) + \frac{c_2}{\lambda_2 + r} \left( 1 - e^{-(\lambda_2 + r)h} \right)
\]

Substituting these expressions into (3) and rearranging gives:

\[
\frac{m_i}{r} \left( 1 - e^{-hr} \right) \left( e^{-rt} - p \right) - \frac{m_2}{r} \left( 1 - e^{-hr} \right) (1 - p) + \frac{c_i}{\lambda_1 + r} \left( 1 - e^{-(\lambda_1 + r)h} \right) \left( e^{-(\lambda_1 + r)t} - p \right) - \frac{c_2}{\lambda_2 + r} \left( 1 - e^{-(\lambda_2 + r)h} \right) (1 - p) = 0
\]

(4)

Since the learning curves are continuous and twice differentiable, the implicit function theorem can be invoked to express the time horizon as a function of the various parameters:

\[ h = f(m_i, c_i, \lambda_1, \tau, p) \]

### 3.3.1. Necessary Condition

Correction of the hiring error could not possibly occur unless, as the time horizon is extended, the expected total cost of a new worker falls relative to that of the incumbent (i.e. unless \( Z \) grows as \( h \) is lengthened). This implies that a necessary, though not sufficient, condition for replacement is \( \partial F / \partial h > 0 \). Differentiating (4) with respect to \( h \) and rearranging gives:

\[
\frac{\partial F}{\partial h} = e^{-rh} \left[ \left( m_i + c_i e^{-\lambda_1(t+h)} \right) e^{-rt} - \left( p \left( m_i + c_i e^{-\lambda_1 h} \right) + (1 - p) \left( m_2 + c_2 e^{-\lambda_2 h} \right) \right) \right]
\]

\[
= e^{-rh} \left[ u_1(\tau + h) e^{-rt} - \left( pu_1(h) + (1 - p) u_2(h) \right) \right]
\]

This reveals that for \( \partial F / \partial h > 0 \), a new worker must be expected to have a lower instantaneous unit labour cost than the incumbent (in discounted terms) by the end of the employer’s time horizon:

\[ u_1(\tau + h) e^{-rt} > pu_1(h) + (1 - p) u_2(h) \]

By setting \( \partial F / \partial h > 0 \), rearranging, and taking the natural logarithm of both sides, the maximum discount rate, \( \bar{r} \), consistent with correction of the hiring error can be determined:

\[
\bar{r} = r < -\frac{1}{\tau} \ln \left( \frac{u_1(\tau + h)}{pu_1(h) + (1 - p) u_2(h)} \right)
\]

(5)

### 3.3.2. Variations in the Parameters

If \( \partial F / \partial h \) is restricted to positive values, the likelihood of replacement will depend upon the various parameters. Some of these effects are self-evident and can be dealt with in a cursory manner. The main exception is the role of learning, which requires closer attention and is left until the next section.
To dispense with the simplest effects first, it can be noted that the longer the recognition lag, $\tau$, the greater the probability of hiring error, $p$, the larger a type 2 worker’s long-run cost efficiency, $m_2$, and the more substantial such a worker’s scope for learning, $c_2$, the longer the employer’s time horizon would need to be for correction of the hiring error to be profitable. These effects are confirmed by the positive signs of $f_\tau$, $f_p$, $f_{m_2}$ and $f_{c_2}$. Briefly, the effect of a lengthy recognition lag is to give incumbents greater opportunity to lock in their initial advantages; a greater probability of hiring error raises the expected cost of employing a new worker; a substantial scope for learning makes a worker’s unit labour cost upon first appointment high compared to its potential level, incurring high costs for the employer initially; while if a type 2 worker’s potential unit labour cost is relatively high, the prospective longer-term gains for the employer of recruiting a replacement will be limited in any case.

The role of the type 1 learning curve is not quite so straightforward. The reason for this is that its shape affects not only the attractiveness of retaining the incumbent, but also the expected cost of employing a new worker; a substantial scope for learning makes a worker’s unit labour cost upon first appointment high compared to its potential level, incurring high costs for the employer initially; while if a type 2 worker’s potential unit labour cost is relatively high, the prospective longer-term gains for the employer of recruiting a replacement will be limited in any case.

3.4. Different Job Types

It is perhaps worth reiterating at this point that, within a job-competition setting, the various components of workers’ unit labour costs are not simply a reflection of their personal attributes. Rather, the shapes and positions of workers’ learning curves are critically influenced by the types of jobs for which they are competing. Thus the observation that hiring errors are more likely to have long-lasting effects on individual earnings where workers’ potential cost differentials are small does not necessarily imply that the failure to reverse such errors is due to small differences in workers’ merit more broadly defined. The small potential cost differential may simply reflect the nature of the job.

Typically, in jobs where the performance of workers could conceivably vary widely, perhaps because considerable scope exists...
for independent thought, action or initiative, there might be ample opportunity for workers to differentiate themselves through performance, which would be reflected in the shapes and positions of their learning curves. In contrast, in jobs that provide little opportunity for workers to excel, perhaps because the pace of work is largely governed by either technology or the tempo of others’ work, the learning curves of different workers would be more or less similar, irrespective of their broader capabilities.12

4. The Effects of Learning

The potential for on-the-job learning to perpetuate the effects of hiring errors remains to be investigated. To gain some insight into the matter, it will be helpful to assume that a type 1 worker’s rate of learning is a constant proportion of a type 2 worker’s rate of learning. Setting $\lambda_1 = \lambda$ and $\lambda_2 = v\lambda$, with $v > 0$, and substituting into (4) gives:

$$f_v = \frac{(1 - p)\lambda c_1}{\partial F/\partial h} \left( e^{(v\lambda + r)h} \left( (v\lambda + r)h + 1 \right) - 1 \right) \left( v\lambda + r \right)^2 < 0^{13}$$

As a first step it is easy to verify that an acceleration of the learning speed of type 2 workers relative to type 1 workers (an increase in the value of $v$) increases the likelihood of the hiring error being corrected:

$$f_v = \frac{(1 - p)\lambda c_1}{\partial F/\partial h} \left( e^{(v\lambda + r)h} \left( (v\lambda + r)h + 1 \right) - 1 \right) \left( v\lambda + r \right)^2 < 0^{13}$$

This confirms that replacement of the incumbent can remain profitable with shorter time horizons if type 2 workers have a relatively rapid rate of learning.

Less obviously, the effects of learning depend on the magnitude of $\lambda$, the rate at which learning occurs. For a given learning-speed differential (or, equivalently, a given $v$), the effects of hiring errors on individual earnings are more likely to persist for some values of $\lambda$ than others. Specifically, hiring errors are more likely to be corrected when the rate of learning associated with the job is either rapid or slow. It is intermediate rates of learning that make correction of hiring errors least likely.14

These tendencies are most easily observed by resorting to direct calculation of $Z$ for different values of $\lambda$, recalling that it is profitable to correct hiring errors if $Z > 0$, but not otherwise. Holding all other parameters constant, the sign of $Z$ depends on the value of $\lambda$. The range of values of $\lambda$ that can be classified as ‘intermediate’ depends on the values specified for the other parameters, but the same basic pattern always emerges. When learning is slow, the incumbent’s headstart is

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12 In distinguishing between jobs on the basis of the scope they provide for workers to differentiate themselves through performance, the question is not simply one of ‘high skill’ versus ‘low skill’ jobs. Desirable conduct from the employer’s perspective may include conformity, acquiescence or passivity, on which workers can clearly differ (Edwards, 1976). For this reason it may be difficult to draw a sharp line of distinction between different types of employment. Nevertheless, the key point remains that some jobs will facilitate greater variation in worker performance than others without necessarily implying anything about the broader capabilities of the workers involved.

13 The sign of $f_v$ is clear if it is recognised that the expression $e^{-(v\lambda + r)h} \left( (v\lambda + r)h + 1 \right) - 1$ in the numerator is of the form $e^x(x+1) - 1$, which is always positive. This makes the entire expression for $f_v$ negative.

14 Spence (1981, p. 57) identifies an analogous effect in industries where costs are characterised by the learning curve. In his analysis, early entrants into an industry are more likely ultimately to dominate the market when learning occurs at moderate rates.
unlikely to be decisive. As the rate of learning is increased into the intermediate range, the profitability of replacing the incumbent falls, but then rises again when learning is rapid. These tendencies are reflected in figure 2 by the inverted ‘humps’ in the curves relating $Z$ to $\lambda$. The same tendencies can be observed in relation to (7), the discount-rate restriction (depicted in figure 3). As $\lambda$ is increased from zero, the maximum discount rate consistent with correction of the hiring error initially falls but then rises again.

This result accords with intuition. In jobs where learning is slow, incumbents might only achieve small reductions in unit labour costs before hiring errors were recognised, limiting the extent of a type 2 worker’s handicap. Additionally, a further hiring error would only have limited cost because a type 1 worker without experience could perform almost as well as the incumbent. Conversely, when learning in a job is fast, a new worker could close any initial cost disadvantage quickly. For learning speeds in the intermediate range, however, gaps that emerge between the unit labour costs of incumbents and new workers are more likely to remain for extended periods. In such instances, it would be possible for incumbents continually to reduce costs over the employer’s entire time horizon, making it harder for a new type 2 worker to bridge the gap.

This connection between the rate of learning and the profitability of reversing past hiring errors may indicate one possible competitive impetus towards deskilling in the design of jobs within capitalist firms (Marx, 1867; Botwinick, 1993, pp. 221-222). Rapid learning will take place in jobs that entail easily mastered tasks; slow learning will occur in jobs that involve only gradual and slight improvements in worker performance over time (in extreme cases, almost no learning over the employer’s time horizon). In either type of employment, on-the-job learning by workers will tend to play little role in capitalist firms’ drive to ever improving cost efficiency. One consequence of this is to make workers easier to replace or, essentially, more expendable. Such expendability is likely to appeal to capitalist employers for a variety of reasons. For one thing, the prerogative of workers to quit under a system of free labour exchange means that employers will need to find replacements from time to time. The more seamlessly new workers can be inserted into the production process, the less firms will experience temporary spikes in labour costs associated with staff turnover. Worker expendability may also serve capitalist employers’ interests as a labour discipline device, especially in periods of high unemployment, but also whenever there is an excess supply of workers for the particular jobs they happen to offer. By contrast, in jobs where worker learning occurs extensively and more or less continuously, replacing a worker can be more costly as well as potentially give workers more control over the work process and greater bargaining power over pay and conditions.\(^{15}\)

5. Implications and Limitations of the Model

It may be worth briefly dwelling on the implications of the present model for individual workers. Whenever hiring errors occur, some workers are advantaged and others disadvantaged for reasons that are unrelated to their respective merits. In those instances where employers subsequently find it unprofitable to correct such errors, the advantages enjoyed, and disadvantages suffered, by individual workers will persist.

The instinctive reaction of some may be to suppose that such persistence is due to the treatment of wages in the model, which are simply taken as given, and attribute the effects to wage ‘stickiness’ or market ‘imperfections’. However, allowing workers to undercut the

\(^{15}\) A recent example of deskilling may be found in information technology, where considerable energy has gone into standardisation and the facilitation of the reusability of previously written code (through an emphasis on object-oriented programming). One effect of these trends is to reduce the personal creative input of the individual worker, which is an element in making workers easier to replace. (Another example of deskilling might spring to an academic’s mind: the trend in university teaching towards the use of homogenised textbooks, complete with pre-packaged lecture materials.)
wages of incumbents would not do anything to alter the basic results. It is true that by lowering the wages they are willing to accept, disadvantaged workers’ learning curves could be shifted down just far enough to make replacement of incumbents profitable for employers (provided incumbents do not respond by accepting lower wages themselves). But, in doing so, the effects of initial hiring errors would merely change form. Rather than disadvantaged workers being forced to accept alternative, inferior employment, or possibly remain unemployed, they would be obliged to accept a lower wage than would have been necessary had the hiring error never occurred. From a purely formal perspective, winning the position at a lower wage is indistinguishable from finding a similar, lower paid job elsewhere. Either way, the hiring error has a persistent effect on individual earnings.

Although the foregoing analysis demonstrates the potential for such persistence in the effects of hiring errors, the gravity of this for individual workers is not an issue that can be addressed within the present model. The significance of a single instance of the job-competition process to individual workers will depend on the extent to which the particular job at stake is superior to their next best alternatives. If missing out on the job is the difference between employment and unemployment, a full-time or part-time position, or a permanent or casual one, the consequences will be more serious than if the next best alternative is of broadly comparable appeal. Since at the aggregate level there is typically unemployment and underemployment, and since workers can queue for new jobs while currently employed, the number of workers queuing for each job, or each category of job, will normally be greater than the number of available positions. In such a context, it is clear that workers who miss out on a particular position may be forced to look elsewhere for less desirable employment. However, the actual degree to which workers’ alternative sources of employment are inferior will depend on the distribution of job opportunities on the one hand, and workers’ positions in the labour queue on the other. Workers’ positions in the labour queue will determine those parts of the distribution of job opportunities that are relevant to them.

An examination of the many factors that influence the distribution of job opportunities and a worker’s position in the labour queue would need to go beyond the scope of the present analysis. But, in fact, much work (both competing and complementary) has already been carried out on these questions, for example by institutionalist theorists adopting the internal labour market approach (notably Doeringer and Piore, 1971), new institutionalists (e.g. Williamson, Wachter and Harris, 1975), those working in the segmented labour market tradition (following Gordon, Edwards and Reich, 1982), and more recently, by classical Marxian economists conceiving both job formation and differential employment access within and between segments of the workforce as driven by the reproduction requirements of capital (exemplified by Mason, 1993, 1995; Botwinick, 1993). What perhaps has been less spelt out (though never far from the surface) is what these theories – as well as Thoow’s job-competition framework itself – suggest about the likely consequences of hiring decisions that fail to reward merit, from the perspective of the individual worker. This question has been the principal concern of the present analysis.

It perhaps needs to be stressed that although the model has been discussed exclusively in terms of random error, the same factors that operate to lock in initial advantages or disadvantages arising from sheer luck will be equally operational when the initial hiring decision is not a random error, but instead one instance of a systematic trend towards the unequal treatment of members of a particular segment of the community. The way in which such differential access to employment emerges under capitalist conditions has been explored by the classical Marxian theorists cited above. Clearly, when members of some segments of the community have less access to job opportunities than members of other segments, discriminatory hiring practices will continually generate and reinforce earnings differentials between the segments that have nothing to do with merit. In relation to discriminatory hiring practices, the present analysis can be viewed in
two ways. It can be regarded as shedding light on the persistence of the effects of hiring errors when these involve members of the same segment of the community. While competitive pressures might promote meritocratic hiring within segments on the average, the model highlights that this does not prevent the persistence of unmeritocratic outcomes in individual instances. The analysis can also be viewed as providing additional insights into how capitalist social processes can reinforce the effects of discriminatory treatment between members of different segments. These insights are distinct, yet complementary, to explanations advanced in earlier work.\(^\text{16}\)

5. Conclusion

The objective of the foregoing analysis has been to address the notion, implicit in some arguments used to defend prevailing inequalities, that the distribution of earned income accurately reflects the relative merits and free choices of individual workers. The desire to focus on this issue has not sprung from any belief in the supposed desirability of ‘meritocracy’. The motive, rather, has been to challenge the perhaps common presumption that those down the lower end of the income scale must be there either through preference or because of a lack of skill, intelligence, effort, perseverance or some other element of so-called merit, this presumption at least partly informed by a view that capitalist competition could not possibly produce anything other than a merit-based distribution. Luck, from such a standpoint, as well as prejudice and discrimination, would seem to have no significant role to play in the determination of individual workers’ earnings.

This impression of capitalist competition and the way in which it is actually likely to influence employment outcomes does not appear to be well founded. Within the model that has been presented, it is not always in the interests of employers to correct previous hiring errors. This result has been obtained without introducing any deviations from profit-maximising behaviour: firms have been taken always to base decisions strictly on the criterion of cost. Nor does the result derive from any reference to ‘rigidities’, ‘impediments’ or ‘obstacles’ to the competitive process: hiring and firing have been assumed to be completely free of cost and instantaneous in execution. Indeed, within the model, it is because of the free labour exchange and profit motive that initial instances of good or bad luck have been found to persist. Or, to put it another way, it is precisely key features of the system that bring about the results of the model. It may appear paradoxical, but if ‘merit’ is the criterion upon which society wishes recruitment decisions to be based, something other than the profit motive will sometimes be needed to drive decisions. Or, conversely, since under capitalism the profit motive is the driving force, meritocracy can fall victim to the imperatives of capital. It is tempting to suggest, in such instances, that meritocracy is made ‘impossible’ by the very thing often claimed to make it inevitable.

Appendix

The complete model, couched in slightly more general terms, starts with the following learning curve:

\[
\theta_i(t) = m_i + c\theta_j(t) \\
\text{(1A)}
\]

where the function \(\theta_i(t)\) captures the learning process and is defined such that \(\theta_i(0) = 1\) and \(\theta_i(t) \to 0\) as \(t \to \infty\). Taken together, these features ensure that \(u_i(t) \to m_i\) as \(t \to \infty\). By assumption, \(\theta_i(t)\) is

\(^{16}\) Mason identifies among classical Marxians “substantial agreement around the notion that alternative forms of discrimination are partly endogenous to material incentives emanating from the competitive process” (Mason, 1993, p. 4, emphasis added). Likewise, in the present analysis, the perspective has been one of viewing capitalist conditions (the free labour exchange, the profit motive, capitalist competition) as often conducive, not counter, to the perpetuation of unmeritocratic outcomes, even when these arise randomly.
continuous and twice differentiable. The presence of learning dictates that \( \theta'(t) < 0 \), but there is no compulsion to restrict the sign of \( \theta'(t) \) over the entire domain of the learning curve unless this is considered desirable in a specific context.

If a type 1 worker receives a headstart of length \( \tau \), the total discounted period cost of retaining the incumbent for the duration of the employer’s time horizon is now:

\[
C_i' = \int_{-\tau}^{\tau} \left[ m_i + c_i \theta_i(t) \right] e^{-\eta t} dt = \int_{-\tau}^{\tau} m_i e^{-\eta t} dt + c_i \int_{-\tau}^{\tau} \theta_i(t) e^{-\eta t} dt
\]

\[
= \frac{1}{r} e^{-\eta \tau} \left[ m_i \left(1 - e^{-\eta \tau}\right) + c_i \left(\theta_i(\tau) - \theta_i(\tau + h) e^{-\eta h}\right)\right] + \frac{c_i}{r} \int_{-\tau}^{\tau} \theta_i'(t) e^{-\eta t} dt
\]

The corresponding costs for type 1 and 2 workers without experience are:

\[
C_i^x = \frac{1}{r} \left[ m_i \left(1 - e^{-\eta \tau}\right) + c_i \left(1 - \theta_i(h) e^{-\eta \tau}\right)\right] + \frac{c_i}{r} \int_{0}^{\tau} \theta_i'(t) e^{-\eta t} dt
\]

\[
C_2^x = \frac{1}{r} \left[ m_2 \left(1 - e^{-\eta \tau}\right) + c_2 \left(1 - \theta_2(h) e^{-\eta \tau}\right)\right] + \frac{c_2}{r} \int_{0}^{\tau} \theta_2'(t) e^{-\eta t} dt
\]

Setting \( Z = 0 \) and rearranging gives:

\[
e^{-\eta \tau} \left[ m_i + c_i \theta_i(\tau) \right] - e^{-\eta (\tau + h)} \left[ m_i + c_i \theta_i(\tau + h)\right] + c_i \int_{0}^{\tau} \theta_i'(t) e^{-\eta t} dt
\]

\[
- p \left[ m_i + c_i \right] - e^{-\eta h} \left[ m_i + c_i \theta_i(h)\right] + c_i \int_{0}^{\tau} \theta_i'(t) e^{-\eta t} dt
\]

\[
- (1 - p) \left[ m_2 + c_2 \right] - e^{-\eta h} \left[ m_2 + c_2 \theta_2(h)\right] + c_2 \int_{0}^{\tau} \theta_2'(t) e^{-\eta t} dt = 0
\]

By the implicit function theorem, \( h \) can once again be expressed as a function of the various parameters.

The necessary condition, \( \partial F / \partial h > 0 \), can be checked by differentiating (2A) with respect to \( h \). Upon rearrangement:

\[
\frac{\partial F}{\partial h} = e^{-\eta \tau} \left[ \left(m_i + c_i \theta_i(\tau + h)\right) e^{-\eta \tau} - \left(p \left(m_i + c_i \theta_i(h)\right) + (1 - p) \left(m_2 + c_2 \theta_i(h)\right)\right)\right]
\]

Rewriting this expression in terms of instantaneous unit labour costs makes it clear that we have arrived at the same expression for \( \partial F / \partial h \) as was derived in the specific model:

\[
\frac{\partial F}{\partial h} = e^{-\eta \tau} \left[ u_i(\tau + h) e^{-\eta \tau} - \left(p u_i(h) + (1 - p) u_i(h)\right)\right]
\]

Accordingly, (6) remains the relevant necessary condition and (7) continues to hold as the appropriate restriction on the employer’s discount rate.

By restricting \( r \) to values below the critical rate, so that \( \partial F / \partial h > 0 \), the signs of the various partial derivatives can be evaluated:

\[
f_r = -\frac{u_i(\tau) e^{-\eta \tau} \left(e^{-\eta \tau} - 1\right)}{\partial F / \partial h} > 0
\]

\[
f_r = -\frac{C_i^x - C_2^x}{\partial F / \partial h} > 0
\]

\[
f_{s_0} = -\frac{(1 - p) \left(e^{-\eta \tau} - 1\right)}{\partial F / \partial h} > 0
\]
Note that in \( f_n \) the sign of the term in large brackets is negative because \( 0 < \theta < 1 \) and \( 0 < e^{-x} < 1 \).

\[
f_n = -\frac{(1 - p)\left(\theta_n(h)e^{-\alpha} - 1\right) - \int_0^\tau \theta_n'(t)e^{-\alpha}dt}{\partial F/\partial h} > 0
\]

Provided \( p < e^{-r} \),

\[
f_n = -\frac{(1 - e^{-h})(e^{-r} - p)}{\partial F/\partial h} < 0
\]

Provided \( p < e^{-r} \),

\[
f_n = -\frac{\left[\theta(t)e^{-r} - \theta(t+h)e^{-r(t+h)} + \int_0^{\tau} \theta'(t)e^{-\alpha}dt\right] - p\left[1 - \theta(h)e^{-\alpha} + \int_0^{\tau} \theta'(t)e^{-\alpha}dt\right]}{\partial F/\partial h} < 0
\]

Provided \( p < \frac{e^{-r} \left(\theta(t) - \theta(t+h)e^{-\alpha}\right) + \int_0^{\tau} \theta'(t)e^{-\alpha}dt}{1 - \theta(h)e^{-\alpha} + \int_0^{\tau} \theta'(t)e^{-\alpha}dt} \)

As was found in the specific version of the model, larger values for \( c_1 \) and \( m_1 \) only make replacement of the incumbent more likely if the probability of hiring error is not too high. Like before, the tightness of the restriction on \( p \) depends on \( r \) and \( \tau \).

References


Case 1. $c_2 < c_1$, $\lambda_2 < \lambda_1$, $m_2 + c_2 < m_1 + c_1$.

Case 2. $c_2 > c_1$, $\lambda_2 > \lambda_1$, $m_2 + c_2 < m_1 + c_1$.

Case 3. $c_2 > c_1$, $\lambda_2 > \lambda_1$, $m_2 + c_2 > m_1 + c_1$. 
**Figure 2**

Example 1: \( m_1 = 100, m_2 = 75, c_1 = 200, c_2 = 150, \tau = h = 1, v = 1.33, r = 0.05 \)

\[
Z
\]

**Figure 3**

Example 1: \( m_1 = 100, m_2 = 75, c_1 = 200, c_2 = 150, \tau = h = 1, v = 1.33 \)

Example 2: \( m_1 = 100, m_2 = 85, c_1 = 200, c_2 = 170, \tau = 10, h = 1, v = 1.176, r = 0.05 \)

\[
Z
\]

Example 2: \( m_1 = 100, m_2 = 85, c_1 = 200, c_2 = 170, \tau = 2, h = 7, v = 1.176 \)